2015

The Effect of Community Education on Osteoporosis Knowledge

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by

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A thesis submitted to the faculty of
Gardner-Webb University Hunt School of Nursing
in partial fulfillment of the requirements for the
Master of Science in Nursing Degree

Boiling Springs, North Carolina

2015

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Abstract

Osteoporosis is a metabolic disorder characterized by the loss of bone mass, increased bone fragility, and the increased risk of fractures. Bone loss is accelerated when the diet is deficient in vitamin D and calcium. The National Osteoporosis Foundation estimates that 57 million Americans are at risk for this disorder. The risk depends on the amount of bone mass achieved between ages 25-35 and how much bone loss occurs after that age. Bone loss increases after menopause. Lifestyle modifications needed include knowledge of vitamin D, calcium, and exercise recommendations.

Keywords: Osteoporosis, low bone mass

Acknowledgments

I would like to thank God for guiding me through this process of continuing education toward obtaining my master's degree. Secondly, I want to thank my husband, Thomas Keith Morrow, Sr. for his love, support, and patience. My children have also been supportive, Thomas Keith Morrow, II, and Kathryn Morrow Bailey. Without their love, I could not have continued to the end. My friends and co-workers have also listened to my questions and worries. Mr. Tim Beaver helped me with the statistics and in helping express the data outcome in words. Thank you also to the faculty of Gardner-Webb University for their support and encouragement. My parents (Charles and Goldie Dixon and Virginia Owens) gave me a solid work ethic and I am following in my mother's footsteps as she graduated from Boiling Springs College in 1939. My uncle, former Math professor here at GWU, Hubert Dixon and his wife, Katy Ruth, were also supportive of my dreams.

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CHAPTER I

Introduction

Bone health is important to the body for its mobility, support, and protection. Bones also act as storage for essential minerals. Bones are living 'organs' that in itself are removed and replaced throughout the lifespan, (National Action Plan for Bone Health, 2015). To promote good health, this study looked at osteoporosis.

Osteoporosis or low bone mass is defined as "a disease marked by reduced bone strength leading to an increased risk of fractures", (Osteoporosis; Facts and Statistics, 2015). It is sometimes referred to as the 'silent disease' because of its progression without symptoms until the first fracture occurs. Many people think that osteoporosis is a natural part of aging and that it cannot be avoided. Research identified that it could be prevented through education, (Osteoporosis: Facts and Statistics, 2015).

The current treatment for osteoporosis involves an individualized plan of care including calcium supplements, vitamin D supplements, weight-bearing exercise, and fall prevention. When adding increased calcium to the daily diet, 800 to 1,500 mg per day provides normal blood levels, (Clinical Study: Osteoporosis, 2015). The National Institute of Health (NIH) recommends the following ranges: Adults: up to 1,500 mg/day, adolescents: 1,300 mg/day, and children: 800 mg/day. Vitamin D supplements needed are 800 to 1,000 international units per day, (Clinical Study: Osteoporosis, 2015). Some treatments call for a combination of calcium and Vitamin D therapy. Weight-bearing exercise plans include three to four hours per week of walking with the use of handheld weights. A fall prevention plan completes the current treatment plan. Progressive strength training and balance training through exercise programs can reduce falls, especially those

including fractures. Major risk factors focus on the post-menopausal woman, the aging adult (male and female), and a history of fractures. "The National Osteoporosis Foundation estimates that more than 10 million Americans currently have osteoporosis and another 34 million have osteopenia (low bone mass)", (Gattulio, Cichminski, Kumar, & Giachetta-Ryan, 2011). Prevention requires attention earlier than when a fracture first occurs or after menopause.

Significance

As The National Osteoporosis Foundation stated that millions of Americans have or are at risk for osteoporosis, the need for knowledge of this disorder exists. Looking back to the 1970s sheds light on how this disorder has progressed to today. The United States Department of Agriculture (USDA) reported a decline in milk consumption among adolescents, (Stewart, Dong, & Carlson, 2013). According to the article, "*Soda and Osteoporosis: Is There a Connection?"* adolescents in the 1970's consumed twice the amount of milk as soda, (Shaw, 2015). By the 21st century, the volume of soda consumption was twice as much as milk consumption. This caused a critical decrease in calcium storage causing the bones to become brittle and susceptible to fractures. The consumption of more cola drinks, with phosphorus for flavoring, may be taking the place of more nutritious options such as milk or fortified orange juice. Studies are in progress to the possible link between phosphorus consumption and osteoporosis, (Stewart et al., 2013).

Diets needed for healthy bones included broccoli, chestnuts, dark green leafy vegetables, flounder, salmon, cottage cheese, sliced cheese, dairy products, and eggs. According to the USDA, foods to avoid included red meats, foods high in fat, soft drinks,

high-protein animal products, and alcohol. A positive effect of three to nine servings per day produced a positive effect to improve outcomes of fractures.

Exercise of at least 60 minutes daily for children is recommended to make and keep strong bones. A four-year study conducted on 7-9 year-old children, 446 boys and 362 girls in the intervention group and 807 boys and 780 girls in the control group, indicated exercise should be initiated in school-age children and continued throughout life "as a strategy for population-based improvement of bone mass, bone size, and fracture resistance," (Lofgren, Dencker, Nilsson, & Karlsson, 2012).

Purpose

The purpose of "The Effect of Community Education on Osteoporosis Knowledge" study was to measure the knowledge base regarding osteoporosis prevention and treatment. Prevention of osteoporosis needs to start earlier in the lifespan. Review of literature showed that there were factors that cannot be changed in relation to osteoporosis: gender, age, body size, race and family history. Factors that can be changed include sex hormone deficiencies (estrogen), diet, certain medical conditions, medications, exercise, alcohol consumption, and smoking.

Theoretical or Conceptual Framework

Sister Callista Roy's Adaptation Theory spoke of the health care continuum coming from poor health to one of wellness (Alligood & Tomey, 2010). As healthcare looked at changeable factors and current treatment of osteoporosis, the ineffectiveness of waiting until after the first fracture and/or after menopause is revealed. Interventions included removing the current diet of fast food choices and little to no exercise regimen. Interventions also included increasing the calcium and Vitamin D in the diet and

increasing exercise to at least 30 minutes 3-4 times a week. If unable to remove fast food choices, then the decrease of that choice as a mainstay to a healthier diet would be preventive in nature. Altering the risk factors of diet and exercise promote adaptation. The Roy Adaptation Model is classified as an outcome theory.

Table 1

Roy's Adaptation Theory Table

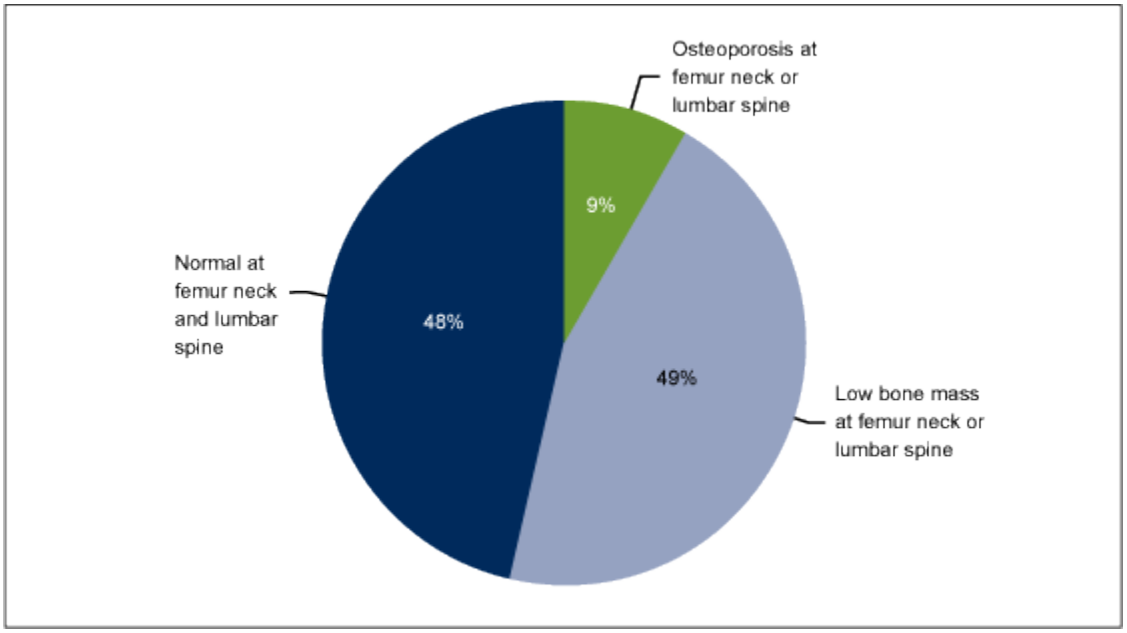
STIMULI	COPING PROCESSES	MODES OF ADAPTATION	INTERVENTION
Gass & Rebar, 2008	Dawson-Hughes, 2014	Blacker & Kleerekoper, 2009	Gattulio et al., 2011
Nelson & Zeratsky, 2011	Schwartz & Chang, 2001	Carmona, 2004	Shaw, 2015
Simpkins, 2010	Walsh & Schub, 2014	Looker, et al., 2012	Stenchever, 2008
Stewart & Carlson, 2013	Bone Mass Measurement, 2012	Vokes & Pham, 2007	Healthy Bones at Every Age, 2013
Tucker, 2006	FRAX, 2011	Clinical Study: Osteoporosis, 2015	National Action Plan for Bone Health, 2015
Can Soft Drinks cause a Problem for my Bones?, 2015	Surveys, 2015	Osteoporosis, 2014 and 2015	Recommendations for Enhancing the Care of Patients with Fragility Fractures, 2015
Carbonated Drinks & Osteoporosis, 2011		Osteoporosis: The Bone thief, 2015	Lofgren et al., 2012

(Literature Search Worksheet for The Effect of Community Education on Osteoporosis Knowlede study.)

Thesis Question

What is the effect of community education on osteoporosis knowledge?

Adaptation to the risk factors of osteoporosis can prevent the disease through education earlier in the lifespan. Clinical trials suggested osteoporosis is found during the fourth decade of life. Diagnostic tests included the bone density tests using dual energy X-ray absorptiometry (DXA), quantitative computed tomography (QCT), single-energy X-ray absorptiometry, radiographic absorptiometry, and ultrasonography. Dual energy X-ray absorptiometry is the test of choice due to its low radiation exposure. If healthy bones at every age are the goal, then education is needed regarding peak bone mass through a calcium-rich diet and regular weight bearing exercise earlier in life, (Looker, Borrud, Dawson-Hughes, Shepherd, & Wright, 2012).



NOTE: The percentages shown will not add up to 100% due to double counting among those with osteoporosis at either skeletal site or low bone mass at either skeletal site.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2005–2008.

Figure 1. Skeletal status of persons aged 50 years and over: United States, 2005–2008 (Looker, Borrud, Dawson-Hughes, Shepherd, & Wright, 2012)

Definition of Terms

- Osteoporosis is defined as a disease of the bones that happens when too much bone is lost, too little bone is made, or both. As a result, bones become weak and may break from a minor fall. The word means porous bone, meaning the bones have lost density or mass and the structure of the bone is abnormal.
- Low bone mass or osteopenia is defined as a condition meaning low bone density. Bone density is a measurement determining the strength of the bones. A greater risk exists for osteoporosis when osteopenia is present.

Summary

The literature showed the connection between the controllable risk factors and the uncontrollable risk factors. Healthcare currently diagnosed osteoporosis in the fourth generation of life. Knowing the risk factors through education including a calcium-rich and vitamin D diet with a regular weight bearing exercise program can help prevent osteoporosis.

CHAPTER II

Literature Review

The purpose of this study revealed the current start of treatment for osteoporosis usually occured after the first fracture for men and women or after menopause for women. Factors that can lead to the prevention of osteoporosis included treatment for sex hormone deficiencies (estrogen), a calcium-rich diet, treating certain medical conditions, medications, developing an exercise plan, decreasing or eliminating alcohol consumption, and smoking cessation. For this research, diet and exercise were the focus. Current review of literature by the nurse researcher substantiated a gap in existing research concerning osteoporosis prevention and education in the prevention of osteoporosis at an earlier age.

The sources used for this literature review included The Cumulative Index for Nursing and Allied Health Literature (CINAHL), EBSCO Host, and several databases and journals regarding osteoporosis education and prevention. Keywords included are osteoporosis and low bone mass.

Stimuli: The Importance of Calcium, Vitamin D, and Exercise.

Understanding the pathophysiology of osteoporosis pointed out that peak bone mass occurred during years of rapid growth. These years are during childhood, adolescence, and early adulthood. Peak bone mass is increased through proper diet and exercise. Calcium is needed for the growth of bone and without it in the diet; the body will pull it from storage. Then the bones become weak and fragile. (Healthy Bones at Every Age, 2013, p. 2)

At birth, there is knowledge of calcium-enriched formula for strong bones and teeth to form properly. During childhood, Vitamin D is recommended via milk consumption and through supplements. Peak bone mass occurred during the years of 10 and 20 years of age. Puberty occurred during this time and as the skeleton develops, "half of the total body calcium stores in women and up to 2/3 of calcium stores in men are made", (Healthy Bones at Every Age, 2013, p. 3). In addition, estrogen production occurred during this time. "Estrogen improves calcium absorption in the kidneys and intestines", (Healthy Bones at Every Age, 2013, p. 3). The teenage years are of particular interest, as this population does not get enough calcium in their diet. The increase of consuming cola drinks decreased the calcium absorption in the intestines. "Exercise during the teen-age years helped this population reach maximum bone strength", (Healthy Bones at Every Age, 2013, p. 4). Between the ages of 20 and 30, the body builds bone at a slower rate. In this age group, Vitamin D supplements and 30 minutes of weight-bearing exercise at least four days a week are beneficial. Of particular interest for this age group is the element of exercise continuing from the teen-age years. "Bones are living tissue that responds to exercise", (What is Osteoporosis, 2014). There is evidence that weight-bearing exercise early in life contributes to higher peak bone mass. Weight-bearing exercises are those that you do on your feet forcing you to work against gravity such as jogging, aerobics, walking, and gardening. (What is Osteoporosis?, 2014).

The aging process revealed itself during 30-50 years of age. Remodeling did not occur anymore. Exercise and Vitamin D supplements aided in preserving the bone strength and the prevention of falls. After age 50, healthy regimens of continuing exercise and Vitamin D supplements are encouraged. (Healthy Bones at Every Age, 2013, p. 5)

The fourth decade of life saw the aging process of increased bone absorption and reduced bone formation. “This leads to bone density and is accelerated by several risk factors”, (Stenchever, 2008). Screening occurred during the annual physical exam at the gynecologist office. Osteoporosis was one important condition assessed during this time. Bone density surveys were conducted and with menopause, estrogen replacement therapy was started as part of the treatment plan. (Stenchever, 2008)

Just in the United States, more than 40 million people have osteopenia or have had at least one fracture. Knowing that weakness of bones can cause them to break is a concern. Following the break of a bone, 20% of senior citizens died within a year of that break (especially if it is a hip fracture). ‘Check Up on Your Bones’, an article by NIAMS, spoke to knowing your risks, getting enough calcium and vitamin D in your diet, smoking cessation, developing an exercise plan and being tested for bone mineral density (BMD), would improve your bone health, (Bone Health and Osteoporosis, 2015). Knowing the recommendations for calcium for your age group is helpful: Daily Calcium and Vitamin D Recommendations, (Bone Health and Osteoporosis, 2015).

Table 2

Daily Calcium and Vitamin D Recommendations

Your Age	Calcium	Vitamin D
19-50 years	1,000 mg	600 IU
51-70 years	1,200 mg	600 IU
Over 70 years	1,200 mg	800 IU
Pregnant or Breastfeeding 19-50 years	1,000 mg	600 IU

(Bone Health and Osteoporosis, 2015)

Exercise recommendations are for at least 30 minutes 3-4 times a week. If unable to do this, gradually work up to it using weight bearing exercises. Talk to the doctor about starting an exercise program and when to start testing your bone mineral density. (Bone Health and Osteoporosis, 2015)

Foods rich in calcium help build bones and keep them strong. Types of food rich in calcium include low-fat dairy food, canned fish with soft bones such as salmon, dark-green leafy vegetables, orange juice, some breads and some cereals. Vitamin D helps the body to absorb calcium. Being outside in the sunlight helps the body to make Vitamin D. Eggs, fatty fish, cereal, and milk also have Vitamin D. The diet is a big part of the prevention of osteoporosis. (Osteoporosis: The Bone Thief, 2015).

In a report by the Surgeon General, by 2020 half of all Americans over 50 years of age will have weak bones unless changes are made in the diet and lifestyle. (Carmona, 2004). Calcium is needed not only for bone growth but also for muscles and nerves to function properly. If calcium is in short supply, the body will take the calcium from the bones. (Carmona, 2004). Bone formation starts with osteoblasts producing osteoid matrix. Calcium and other minerals harden this matrix. Large bone cells (osteoblasts) reshape bones by resorbing minerals and organic components. In osteoporosis, the osteoblasts continue to produce bone but resorption exceeds the bone formation (Gattulio et al., 2011). Also during osteoporosis, the body is withdrawing more calcium than is being deposited.

In the report above, 60 minutes of exercise is recommended for children. Playing outside daily for up to 60 minutes along with calcium-rich and Vitamin D diet increases the strength of bones. Recommended calcium for children is 0-6 months: 210 mg daily,

7-12 months: 270 mg daily, 1-3 years of age: 500 mg daily, 4-8 years of age: 800 mg daily, 9-18 years of age: 1,300 mg daily. A cup of milk or fortified orange juice has about 300 mg of calcium. Having a list of calcium-rich foods and reading food labels would help meet daily calcium recommendations. Studies showed that only half of teenagers exercise on a regular basis and one-fourth of teenagers do not exercise at all. When bone formation does not occur during the teenage years, it cannot be made up later when it is needed. (Carmona, 2004).

Questions may come to mind about why children and teenagers are drinking less milk or eating enough calcium- and Vitamin-D rich foods. A survey accomplished by the USDA in 1977-78 and 2007-08 showed that there is a 12% then to 24% now decline in the consumption of daily milk consumption in preadolescent children. The same survey showed that drinking milk three or more times a day dropped from 31% then to 18% now in the same age group. This survey also found that each generation consumes less milk than the one before it. The "Got Milk?" commercials were a part of the campaign to drink more milk and therefore to consume more calcium. Another result of the survey was that even though the government programs of National School Lunch Program (NSLP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) are available, the consumption of milk is still low (Stewart et al., 2013).

Each generation has a wider selection of beverages to choose from for drinking. Now, there are soft drinks (carbonated), isotonic sports drinks, bottled water, and fruit juices in addition to tea and milk. There are also fast food choices. The *Dietary Guidelines for Americans, 2010* states children "who consume milk at an early age are more likely to do so as adults", (Stewart et al., 2013).

Carbonated soft drinks may cause increased bone density loss leading to decreased skeletal strength. Studies showed that cola beverage choices take the place of milk choices and therefore bone loss occurs. "The culprit may be the phosphorus in cola drinks. Phosphoric acid in cola drinks hampers the absorption of calcium. The body pulls calcium out of the bones to balance the blood levels", (Carbonated Drinks & Osteoporosis, 2011).

Modes of Adaptation: Looking at Test, Studies and Trials

Guidelines for osteoporosis assessment are based on "bone mineral density at either the femur neck region of the proximal femur (hip) or the lumbar spine", (Looker et al., 2012). The Third National Health and Nutrition Examination Survey (NHANES III) results showed, "Nine percent of adults aged 50 years and over had osteoporosis at either the femur neck or lumbar spine. About one-half had low bone mass at either site, while 48% had normal bone mass at both sites", (Looker et al., 2012). The prevalence was higher in women and increased with age. In fact, it increased with each decade after age 50 years of age. Having osteoporosis increases the risk of experiencing a fracture.

An explanation of the bone mass measurement from a DXA test is called a T-Score. "Differences between the BMD of the patient and that of a healthy adult norm are measured in units called standard deviations (SDs). The more standard deviations below O, indicated in negative numbers, the lower your BMD and the higher your risk of fracture", (Bone Mass Measurement: What the Numbers Mean, 2012).

The International Osteoporosis Foundation (IOF) has commissioned seven surveys focusing on specific aspects of osteoporosis awareness and the importance of treatment. They are: 1. Stop the Stoop, 2. Timeless Women, 3. Closing the Adherence

Gap in Osteoporosis, 4. How Fragile is Her Future?, 5. OsteoLink Survey, 6. Why Osteoporosis Patients Don't Continue With Treatment, and 7. IOF Osteoporosis Risk and Nutrition Awareness Survey. (Surveys, 2015) In the survey results for *Timeless Women: The Campaign for Stronger Bones*, actress Ursula Andrews gave the introduction calling osteoporosis a "silent thief". The disease steals your bone's strength. The survey speaks to women being more susceptible than men are to osteoporosis due to decreased estrogen levels. Estrogen is necessary for maintaining strong bones. Diagnosing osteoporosis may be through the DXA bone scan to measure their bone mineral density (BMD). "Bone mineral density is a measure of the bone mineral content at a specific site, divided by the area measured. Above -1 is considered normal, between -1 and -2.5 means a person could have osteopenia, and below -2.5 indicates a person has osteoporosis", (Timeless Women: The Campaign for Stronger Bones, 2015). Other results from the survey stated that one out of three women over the age of 50 will suffer a fracture due to osteoporosis.

The World Health Organization (WHO) has a new tool called the Fracture Risk Assessment Tool (FRAX) to aid in determining if a woman is at risk for fracture. It indicated a 10 year probability as a percentage, which provided guidance for determining the need for treatment. This survey was for women ages 40-90. This survey came because of osteoporosis risk factors with or without knowing the BMD measurement. "This tool will aid in estimating risk and probability of fracture in the next 10 years of untreated patients", (Fracture Risk Assessment Tool (FRAX), 2011).

A clinical study entitled "Bisphosphonate Users Radiographic Characteristics of the Hip (BURCH) Study" is accepting applicants now to compare the hip x-rays of three groups: people who have been taking osteoporosis drugs for several years, those have just

started taking them, and those who have never taken these drugs. Participants are to be 50 years old and older, men and women. The sponsoring institute is the National Institute of Arthritis and Musculoskeletal and Skin Disorders (NIAMS). Children are not included in this survey. The participants are initially asked to have three visits over three years, complete a history and physical, complete a questionnaire, have an x-ray of their hips and pelvis, a BMD scan, then repeat all of these tests at the second and third visits. "The results will correlate medication usage with a radiographic feature", (Clinical Study: Osteoporosis, 2015).

A clinical trial entitled "Texture Analysis for Postmenopausal Osteoporosis" was verified in March 16, 2007, by the University of Chicago. This trial wanted to address the outcome of patients using antiresorptive therapy after two years in relation to their x-rays. Alendronate was the medication therapy in question. The x-ray was looking for bone turnover. By using this trial, the goal was to determine whether the use of texture analysis (bone being x-rayed) improved the clinician's ability to diagnose bone status and continue the use of the antiresorptive medication (Vokes & Pham, 2007).

The Framingham Osteoporosis Study addressed soft drink consumption having adverse effects on bone mineral density. "Results of the study showed that cola intake is associated with lower BMD results at each hip site but not the spine in women but not in men", (Tucker, Morita, Qipao, Hannan, Cupples, & Kiel, 2006). In addition, calcium to phosphorus ratios was lower. The participants of this study were older women. "Osteoporosis and related fractures represent major public health problems. With the aging of the population, the increase in both is expected to increase dramatically in the next few decades", (Tucker et al., 2006).

Harvard Medical School reported on the theory of carbonated beverages being connected to bone loss. Their report gave information from a Tufts University study of 2,500 women and men (ages 49-69) involved in the Framingham Osteoporosis Study. The result was women had less calcium intake. "In 2005, the *British Journal of Nutrition* published results of a trial comparing postmenopausal women who drank carbonated mineral water to the same amount of noncarbonated mineral water daily" (Simpkins, 2010). There was no difference in bone turnover.

The Mayo Clinic in their article, "Carbonated Water and Bone Health" stated that carbonated water did not affect bone health, (Nelson & Zeratsky, 2011). "There is a connection between carbonated cola drinks and low bone mineral density but not with non-cola carbonated drinks"; (Nelson & Zeratsky, 2011). "People with osteoporosis should not drink more than five cola drinks a week", (Can soft drinks cause a problem for my bones?, 2015). This statement explained that cola drinks contain phosphoric acid, caffeine, and other chemicals. Caffeine can cause bone loss if in large amounts because it interferes with calcium absorption. The important thing to remember is not to substitute caffeinated drinks for milk and/or calcium enriched juices.

"Fragility fractures, (fractures resulting from a fall from a standing height or less, or presenting in the absence of obvious trauma), should be treated a sentinel events. This recommendation enables earlier diagnosis and treatment of osteoporosis", (National Action Plan for Bone Health, 2015). Following a fracture, the orthopedic surgeon recommended an osteoporosis evaluation. Treatment was started to protect bone health. (Recommendations for Enhancing the Care of Patients with Fragility Fractures, 2015).

Tania Winzenberg, one of the authors of the Osteoporosis Knowledge Assessment Tool (OKAT), used the tool in a Caucasian pre-menopausal women population. She reported that there was no validated tool to measure knowledge of osteoporosis in the "25-44 year age group", (Winzenberg, Oldenburg, Frendin, & Jones, 2003). When giving the test, answers were scored as 1 for each correct answer and 0 for each incorrect answer, so the total score could be 20. The average age of the research group was 37.8 years of age. There was a wide range of educational levels. The results of the research showed a low level of knowledge. It could have been the use of the word osteoporosis throughout the survey. When the words thin bones were used, the understanding score was elevated. The average score for this research project was "8.8 being 44% of the possible maximum score", (Winzenberg et al., 2003). This research was done with Australian women, so other populations would need further study.

In another study, Rima Sayed-Hassan and Hyam Bashour used the Osteoporosis Knowledge Assessment Tool to measure the knowledge of osteoporosis in the Arabic community. A total of 100 women were recruited to test the reliability of the OKAT. The tool was proven valid. The tool proved to be "effective in implementing educational interventions", (2013).

Coping Processes: Understanding the Effects of Osteoporosis

The "rectangularization of the survival curve" phenomenon as mentioned in the article, "*Demographics of the Aging Population"*, (Gass & Rebar, 2008), spoke to the advancement of health care and the calculated life expectancy of the U. S. population. The life expectancy of Caucasian women has risen from 51 years of life in the year 1900 to 80 years of life in the year 2000. This report stated, "Of all the hospitalizations due to

injuries, fractures lead the list. Hip fractures rates are twice as high for women as for men", (Gass & Rebar, 2008). These fractures are due partly because of osteoporosis. "Using the definition from the World Health Organization, osteoporosis is -2.5 standard deviations below the mean bone mineral density of a young healthy woman", (Gass & Rebar, 2008). Osteopenia, a condition defined as low bone mass, is defined as -1.0 to -2.5 standard deviations below the mean bone mineral density of young healthy women. (Gass & Rebar, 2008)

Men also have osteoporosis. They start with more bone density than women do and with aging, they lose bone density at a slower rate. Their risks include a family history of osteoporosis, not enough calcium and/or Vitamin D in their diets, too little exercise, low levels of testosterone, drinking too much alcohol, taking certain medications, and smoking. Treatment for men diagnosed with osteoporosis usually begins after the first fracture. (Osteoporosis: The Bone Thief, 2015).

"Among men who are 50 years of age and older, the lifetime risk of having a fracture related to osteoporosis in the hip, spine, or distal forearm is 13% compared to 40% in women in the same age group", (The Osteoporosis Report, 2014). In addition, fractures in men happen 5-10 years later in life than women who have osteoporosis. Men do not have a rapid hormone deficiency like women do during menopause.

Interventions: Education and Prevention

The Medical Women's International Association (MWIA) involved female physicians from all six continents addressing women's health concerns. Osteoporosis affects women who are raising the family including grandchildren, working out the home, and working inside the home. These women want to stay active. "The MWIA address

educating the women and then she educates the family", (Osteoporosis: Facts and Statistics, 2015).

Treatment plans for osteoporosis patients included pharmacologic therapy: antiresorptive or anabolic agents. "Antiresorptive agents inhibit osteoclastic function and reduce the frequency of the remodeling units within the bone. These drugs increase BMD by laying down new bone on the surface of existing bone. Anabolic agents fill in the gaps of the bone", (Blacker & Kleerekoper, 2009). Antiresorptive agents include Alendronate, Risedronate, Ibandronate, Zoledronate, Raloxifene, Estrogen, and Calcitonin. Anabolic agents include Teriparatide. With any medication, there are side effects. For example, with estrogen there is the positive benefit on BMD at all skeletal sites and the negative effect of possible vaginal bleeding and the fear of uterine and breast cancer development. "Bisphosphonates, as mentioned in the clinical study above, inhibit osteoclastic bone resorption, and are then buried within the skeleton for 10 to 12 years", (Blacker & Kleerekoper, 2009). This drug has been shown to prevent bone loss and reduce fractures. "Teriparatide (Parathyroid hormone-PTH) is an injection given daily for up to two years to post-menopausal women and to men who are at high risk for broken bones. It improves bone density in the spine and hip", (Osteoporosis: The Bone Thief, 2015).

Prevention is still the best approach to osteoporosis. Studies continued on post-menopausal women and at random, "women who take bisphosphonates have decreased fractures. Following closely is hormone replacement therapy (HRT) such as estrogen in reducing fractures", (Schwartz & Chang, 2001). Other treatments of choice included a combination therapy of calcium and vitamin D along with exercise and smoking cessation. These therapies have been associated with increased bone density.

Prevention and education are important in estimating the effect of osteoporosis on future generations. The Osteoporosis Report of 2014 states, "that a total of 54 million U.S. adults, representing more than one-half of the total U.S. adult population, is currently affected by osteoporosis and low bone mass", (The Osteoporosis Report, 2014). To protect bone health, several measures are necessary. Achieve peak bone mass through exercise, calcium absorption and Vitamin D absorption during youth. "Eighty percent of bone mass is genetically determined and twenty percent can be modified by lifestyle", (Dawson-Hughes, 2014). Clinicians need to see inside the bone. This would enable them to predict who will have osteoporosis. "There is promise in a high-resolution peripheral quantitative tomography, which can do images of the wrists. These can give more information on the strength of the bone", (Shaw & Nazario, 2015). Biomarkers, chemical measurements in the blood and urine, can help improve understanding of people at risk for osteoporosis. Future treatments may include studies on a protein called LRP5 (low-density lipoprotein receptor-related protein 5). People with this high bone protein do not break any bones even if they are in serious car accidents. "Vitamin D analogs (minimize bone loss and maximize bone formation) are being investigated as treatment for osteoporosis", (Shaw & Nazario, 2015).

Public and professional awareness are needed to have effective prevention and treatment of osteoporosis. There is a stigma attached to osteoporosis since the culture is now youth-obsessed. Education is needed to advocate for exercise opportunities and better diets for our children and youth. Alliances are needed in all organizations where vulnerable populations are served. Gaps in in the literature review included successful measures to prevent osteoporosis. Knowing that peak bone mass occurs prior to age 20,

more emphasis and education needs to be placed on building and maintaining bone health with calcium and Vitamin D in the diets of children and teen-agers. Exercise across the lifespan, starting in schools and at home, and continuing into adulthood aids in the prevention of osteoporosis.

CHAPTER III

Methodology

Setting

The target population for this study was females age 18 and older. This group consisted of Caucasian women from a Baptist church located in a small rural town in western North Carolina. Participants who attended were volunteers attending an educational opportunity offered after their weekly meal on a Wednesday night.

Sample

The sampling procedure used by the researcher was one of convenience using non-probability sampling. The participants were restricted to females over the age of 18 years old. The target goal included 20 participants. All 20 of the participants completed all 20 questions on the pre-test and on the post-test. No one declined to answer any of the questions. This sample size was due to the specified time frame for data collection.

Procedure

A pre-test of 20 questions using the Osteoporosis Knowledge Assessment Tool (OKAT) in paper format was given out at the beginning of the educational session, (See Appendix A). Permission to use this tool was received from one of the authors of the tool, Tania W. Winzenberg (See Appendix B). A demographics information (age and educational level) form was given to the participants, (See Appendix A). The purpose of the data collection was explained and the participants were informed of the voluntary consent, the confidentiality of the data, and the results delivery. Following the pre-test, an educational opportunity about Osteoporosis was given using a PowerPoint presentation. Handouts involving risks, medications, calcium and Vitamin D counter, and exercises

were given to the participants. A post-test of 20 questions using the Osteoporosis Knowledge Assessment Tool (OKAT) was given to the participants following questions and answers to the PowerPoint presentation. The participants were asked to choose at random numbers and/or letters to identify their pre-test and post-test by writing it at the top of the page.

Instrument

The Osteoporosis Knowledge Assessment Tool (OKAT) was written as part of a study to encourage exercise and calcium intake in the prevention of osteoporosis. In the article, "*The Design of a Valid and Reliable Questionnaire to Measure Osteoporosis Knowledge in Women: The Osteoporosis Knowledge Assessment Tool (OKAT)*", authors Tania M. Winzenberg, Brian Oldenburg, Sue Frendin, and Graeme Jones based their tool on the Osteoporosis Australia Osteoporosis Prevention and Self-Management course and the information leaflet "Understanding Osteoporosis," (2003). The questionnaire had a Ferguson's sigma of 0.96, a Cronbach's alpha of 0.70 and factor analysis consistent with only one factor (osteoporosis knowledge) being measured (Winzenberg et al., 2003).

Ethical Considerations

Ethical considerations were taken into account throughout this research. No incentives or compensation were offered to the survey participants. All participants were educated using all aspects of informed consent (Appendix C) with specific attention given to voluntary as well as anonymous participation. The questionnaires were taken up by the researcher at the end of the education presentation. Pre-tests and post-tests were separated using an identification at random chosen by each participant for the data collection. They also checked whether pre-test or post-test listed at the top of the test.

Permission was obtained through the Institutional Review Board of the University and the church setting gave permission for the educational presentation and for use of the building, (See Appendix D).

Research Design

The research design was one of quantitative data between subjects using a pre-test and post-test design. The data was collected all at once. No intervention or treatment will be implemented. Handouts were given to the participants in regards to recommendations.

Malcolm Knowles discussed the adult learner as needing the core principles of education. His six principles are " (1) the learners need to know, (2) self-concept of the learner, (3) prior experience of the learner, (4) readiness to learn, (5) orientation to learning, and (6) motivation to learn", (Knowles, Holton, & Swanson, 2015, p. 5). He wrote that there were also individual and situational differences in adult learning as well as goals and purposes of learning, (Knowles et al., 2015, p. 6). Given that this study reviewed the literature on osteoporosis, the risks, the treatment and the prevention of this disease, the reader could learn through the educational session on osteoporosis the information needed to prevent this disease.

With the education given, the participant can then use the learned knowledge and make adaptations to diet and exercise. Behaviors can change in regards to the eating of fast foods to the healthier diets with recommended dosages of calcium and vitamin D. Exercise can be incorporated in the daily activities. Maslow mentions self-actualization as being "a concept of growth for the individual to move toward fulfilling the highest needs", (Olson, 2013). To reach the highest goal of health, Roy talks about the effect

behaviors have on the individual. Information given to the individual in the education session confronts the individual to look at their behaviors, diet and exercise choices. As the individual looks at the situation, decisions can be made about self-concept. “The goal of nursing is to promote adaptive responses, (Alligood & Tomey, 2010, p. 356.).

CHAPTER IV

Results

The purpose of this study was to present the knowledge of osteoporosis treatment being a combination of calcium, Vitamin D and exercise. With a decline in milk and dairy consumption, the data showed that the current population is drinking other liquids. One of these liquids is carbonated drinks. With fast food diets on the rise, the current population is not getting enough calcium and Vitamin D in the diet. Exercise for at least three times a week for at least 30 minutes was not known to make and keep bones strong. Factors that can be changed include a diet rich in calcium and Vitamin D (meeting recommendations for age), and exercise. Education earlier in the life cycle could prevent osteoporosis as data shows that this disease occurs in the fourth decade of life.

Using quantitative analysis, the 20 participants were ages 18-82 years of age with the average age of 59 years of age. The education levels of the 20 participants spanned from grade school level through five years of college with the average educational level of 11 years of education. The study analysis started with a direct comparison of the pre-test score and the post-test score. The object of this analysis was to see if there is a positive correlation between the scores. By this response, the curriculum can be studied to see if the test scores would improve.

As a result, a hypotheses was performed on the pre-test and the post-test. The equation is H_0: $p = 0$ vs H_1: $p > 0$ (which is there is no correlation for =, versus there is a positive correlation for >. This is tested with 18 degrees of freedom (since n = 20), and testing at the traditional $\alpha = 0.05$, with a critical value of 1.734.

Then the test value is computed, which is given by the formula: $\times \sqrt{\frac{n-2}{1-r^2}}$, which will produce a test value of $t = 2.686$. Since this value is greater than 1.734 (which means that $p > 0$ is supported), it is concluded at the $\alpha = 0.05$ level there is a correlation between the pre-test and the post-test scores.

Based on this conclusion, there was enough evidence to support the claim that this educational program improves the community's general knowledge about osteoporosis. Furthermore, as a result of there being a positive correlation, a linear regression analysis of the data can be done. Based on this, there is a best-fit linear equation of y' = 0.3772x + 42.603. This would predict that, on average, a student going through this education will gain 0.4 points per question. Since there are 20 questions, this would predict an average increase of eight points on the post-test compared to the pre-test (0.4 * 20). (Figure 2)

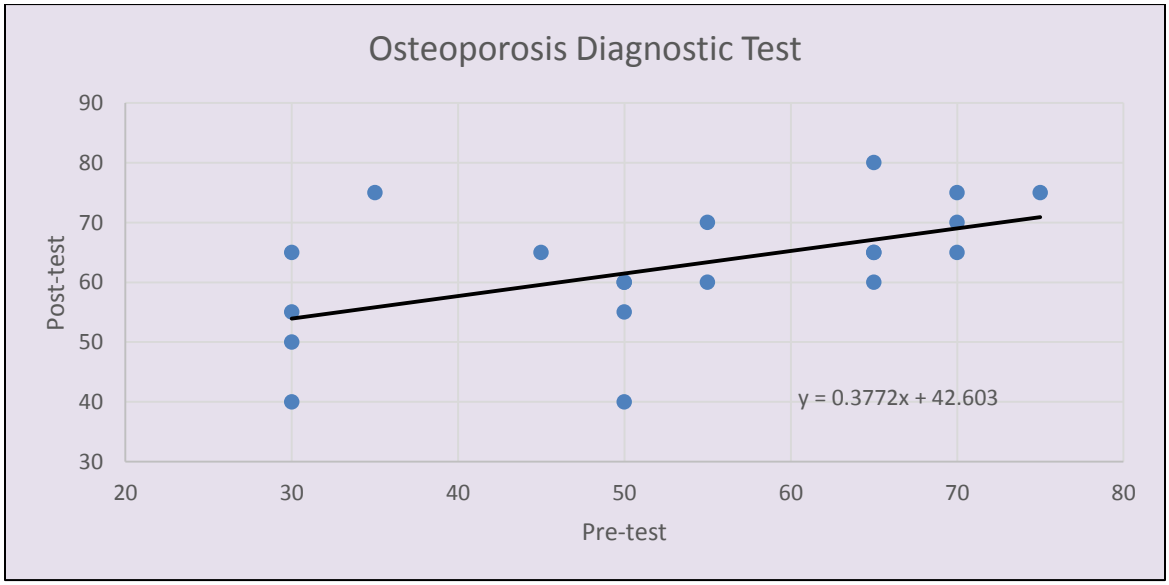


Figure 2: Osteoporosis Diagnostic Test

CHAPTER V

Discussion

The purpose of this study was to examine the knowledge of a random population of females age 18 and older concerning osteoporosis. The research revealed that changes in the diet to include recommended dosages of calcium and Vitamin D along with regular exercise could improve risks for and/or prevent osteoporosis. The research also revealed that this disorder occurs in the fourth decade of life. Testing is done for osteoporosis after the first fracture or after menopause. Osteoporosis is detected during these exams.

The analysis revealed that test scores improved with education about osteoporosis. When Tania M. Winzenberg conducted a study using the Osteoporosis Knowledge Assessment Tool (OKAT), she found that osteoporosis knowledge is an important contributor to improving exercise and calcium intake behaviors. She used a population of Australian pre-menopausal women ages 25-44 years of age, (Winzenberg et al., 2003).

There are a significant number of limitations. While this sample was randomly selected through an open invitation in the church bulletin for women ages 18 and over, only 20 participants were expected. Only 20 participants participated in this study. Time constraints were noted in that several of the women felt rushed due to the scheduled choir practice following the educational session. The educational program could be improved to specify smokers or post-menopausal women to change the dynamics of the scoring.

Knowles spoke of the individual accountability and responsibility in improving one's knowledge, (Knowles et al., 2015, p. 16). An individual looks at the experience of what is happening and what is the importance or connection to the disorder or disease.

Carl Rogers, clinical psychologist, thought that learning can only be facilitated, (Knowles et al., 2015, p. 27). He looked at the student as being the center of a changing world of experience.

Sister Callista Roy described the Adaptation Model theory as, "the process and outcome whereby thinking and feeling persons, as individuals or in groups, use conscious awareness and choice to create human and environmental integration", (Alligood & Tomey, 2010, p. 341). The theory points to taking human action in transforming health outcomes. Through adaptation, a person can be effective by choice in changing their health.

Conclusion

In conclusion, this study noted in giving information about calcium and vitamin D recommendations, along with an exercise plan in collaboration with the physician, an individual's education on osteoporosis knowledge is affected. The implications of this study focused on educating about health, how illness affects the individual, and how behaviors can lead to illness. Other actions given were to review the current diet and exercise program of the individual as to whether adaptations were to be made.

"Nurses provide interventions that alter, increase, decrease, remove, or maintain stimuli", (Alligood & Tomey, 2010, p. 345). In application of this study, an individual can review the educational osteoporosis information and apply it to living with improved health. Outcomes of improved health were the focus.

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Appendix A

Osteoporosis Knowledge Assessment Tool (OKAT)

Osteoporosis Knowledge Assessment Tool (OKAT)

Check one: Pre-test _____ Post-test _____

Your choice of ID _____

Demographics

1. Age _____
2. Last grade completed _____

Osteoporosis Knowledge Assessment Tool (OKAT)

Please answer each of the following questions with True, False, or Don't Know.

1) Osteoporosis leads to an increased risk of bone fractures.

□ True □ False □ Don't Know

2) Osteoporosis usually causes symptoms (e.g. pain) occur.

□ True □ False □ Don't Know

3) Having a higher peak bone mass at the end of childhood gives no protection against development of osteoporosis in later life.

□ True □ False □ Don't Know

4) Osteoporosis is more common in men.

□ True □ False □ Don't Know

5) Cigarette smoking can contribute to osteoporosis.

□ True □ False □ Don't Know

6) White women are at highest risk of fracture as compared to other races.

□ True □ False □ Don't Know

7) A fall is just as important as low bone strength in causing fractures.

□ True □ False □ Don't Know

8) By age 80, the majority of women have osteoporosis.

□ True □ False □ Don't Know

9) From age 50, most women can expect at least one fracture before they die.

□ True □ False □ Don't Know

10) Any type of physical activity is beneficial for osteoporosis.

□ True □ False □ Don't Know

11) It is easy to tell whether I am at risk of osteoporosis by my clinical risk factors.

□ True □ False □ Don't Know

12) Family history of osteoporosis strongly predisposes a person to osteoporosis.

□ True □ False □ Don't Know

13) An adequate calcium intake can be achieved from two glasses of milk a day.

□ True □ False □ Don't Know

14) Sardines and broccoli are good sources of calcium for people who cannot take dairy products.

□ True □ False □ Don't Know

15) Calcium supplements alone can prevent bone loss.

□ True □ False □ Don't Know

16) Alcohol in moderation has little effect on osteoporosis.

□ True □ False □ Don't Know

17) A high salt intake is a risk factor for osteoporosis.

□ True □ False □ Don't Know

18) There is a small amount of bone loss in the ten years following the onset of menopause.

□ True □ False □ Don't Know

19) Hormone therapy prevents further bone loss at any age after menopause.

□ True □ False □ Don't Know

20) There are no effective treatments for osteoporosis available in the United States.

□ True □ False □ Don't Know

Appendix B

Permission to use OKAT by Author

RE: Request to use OKAT in thesis paper

Tania Winzenberg [Tania.Winzenberg@utas.edu.au]

You forwarded this message on 5/26/2015 10:42 PM

Sent: Tuesday, May 12, 2015 9:53 PM

To: Avis Morrow

Dear Avis

Thank you for your interest in our work. We are happy for the OKAT to be used by others, provided the use is acknowledged and our BMC Musculoskeletal validation paper is cited in any publications resulting from its use.

You can download the questionnaire from BMC Musculoskeletal: http://biomedcentral.com/1471-2474/4/17. The OKAT is located in the methods section as an additional file, which you can click on to download. If you have any problems, let me know.

We have only used the OKAT as described in Caucasian premenopausal women. While I can see no reason why it should not be effective in other populations, as with all these sorts of questionnaires, you can really only confidently state its validity for use in populations similar to that in which it was studied. So if I were using the OKAT in other populations, I would include some validation in whatever publication results if the population were very different for ours.

The answers to the OKAT are given below. We scored 1 for each correct, 0 for incorrect or don't know. With regards to the last question, you could just drop the "in Australia" and still use the question – this is what I would suggest.

Please let me know if I can be of more help.

Tania

The correct answers to the questionnaire as we used it are:1) T, 2) F, 3) F, 4) F, 5) T, 6) T, 7) T, 8) T, 9) T, 10) F, 11) F, 12) T, 13) F, 14) T, 15) F, 16) T, 17) T, 18) F, 19) T, and 20) F.

Professor Tania Winzenberg: Professor of Chronic Disease Management

Menzies Institute for Medical Research and School of Medicine University of Tasmania

Appendix C

Research Participant Consent Form

Research Participant Consent Form

The Effect of Community Education on Osteoporosis Knowledge

You have been asked to participate in a research study. The investigator is a registered nurse studying the effect of education on osteoporosis knowledge. The research data will be presented to the faculty of Gardner-Webb University Hunt School of Nursing in partial fulfillment of a thesis project.

Your involvement in this study will consist of completing a pre-test, listening to an educational opportunity regarding osteoporosis, and completing a post-test. Participation in this study will take approximately 30 minutes. The answers will be analyzed by the researcher to assess the participant's knowledge of osteoporosis.

Your participation is entirely voluntary. You have the right to refuse to participate in this study. Your refusal to participate in this study will not affect any benefits or your relationship with your church. You may answer or not answer any of the questions on the survey. You also may stop the survey at any time. If you would like a copy of the completed study, one will be made available to you at no cost.

There are no foreseeable risks or benefits associated with this study. This is an anonymous study. At no time will your identity be revealed to the researcher or the faculty of Gardner-Webb University.

Any questions or concerns regarding this study should be directed to Avis Morrow, BSN, RN at 704-472-2747 or to Dr. Nicole Waters, DNP, RN at 704-406-4000.

I have read this consent form and voluntarily consent to participate in this study.

Participant's Signature _____ Date _____

Appendix D

Permission from Church Setting

Bethlehem Baptist Church
1017 Bethlehem Road
Kings Mountain, NC. 28086
(704) 739-7487
Fax (704) 739-1229

April 1, 2015

To Whom It May Concern:

Avis Morrow has the support and permission of Bethlehem Baptist Church to do a survey of/with our members for her MSN thesis.

Should you need further information or clarification, please feel free to contact us. Thank you.

Sincerely,

Rev. Dr. Stephen L Taylor

rl

E-mail: bbckmnc@aol.com

Website: www.bethlehemkmnc.org